Developing Web Applications using JavaServer Faces

This IBM® Redpaper™ publication introduces the features, benefits, and architecture of JavaServer Faces (JSF), a framework that simplifies building user interfaces for web applications. This paper is intended for web developers interested in JSF. The paper includes an example application that uses JSF, with persistence implemented in the Java Persistence API (JPA).

The paper also demonstrates the support for JSF that is available in IBM Rational® Application Developer for IBM WebSphere® Software V8, the Eclipse 3.6 technology-based platform for building Java Platform, Standard Edition Version 6 (Java SE 6), and Java Platform, Enterprise Edition Version 6 (Java EE 6) applications. Rational Application Developer focuses on applications to be deployed to IBM WebSphere Application Server and IBM WebSphere Portal. Rational Application Developer also provides integrated tools for all development roles, including web developers, Java developers, business analysts, architects, and enterprise programmers.

The paper is organized into the following sections:
- Introduction to JSF
- Developing a web application by using JSF and JPA
- More information

The sample code shown in this paper is available in the 4883codesolution/jsf folder.

This paper was originally published as a chapter in the IBM Redbooks® publication, Rational Application Developer for WebSphere Software V8 Programming Guide, SG24-7835. The full publication includes working examples that show how to develop applications and achieve the benefits of visual and rapid application development. The publication is available at the following website:

Introduction to JSF

The JSF framework allows users to utilize pre-built components and easily create web applications. For example, JSF provides an Input Text, Output Text, and a Data Table component. You can add these components easily to a JSF web page and connect them to the data of your project. JSF technology and the JSF tools provided by Rational Application Developer enable even inexperienced developers to quickly develop web applications.

This section provides an overview of the following aspects of JSF:
- JSF 1.x features and benefits
- JSF 2.0 features and benefits
- JSF 2.0 application architecture
- JSF features in Rational Application Developer

JSF 1.x features and benefits

The JSF 1.x specification is defined in Java Specification Request (JSR) 127: JavaServer Faces.

The following list describes the key features and benefits of using JSF for web application design and development:
- Standards-based web application framework: JSF technology is the result of the Java Community process. JSF uses the model view controller (MVC) pattern; it addresses the view or presentation layer though user interface (UI) components, and addresses the model through managed beans.
- Event-driven architecture: JSF provides server-side rich UI components that respond to client events.
- UI development:
  - UI components are decoupled from their rendering, which means that they can be extended to use other technologies, such as Wireless Markup Language (WML).
  - JSF allows direct binding of UI components to model data.
  - Developers can use extensive libraries of prebuilt UI components that provide both basic and advanced web functionality. In addition, custom UI components can be created and customized for specific uses.
- Session and object management: JSF manages designated model data objects by handling their initialization, persistence over the request cycle, and cleanup.
- Validation and error feedback: JSF allows direct binding of reusable validators to UI components. The framework also provides a queue mechanism to simplify error and message feedback to the application user. These messages can be associated with specific UI components.
- Globalization: JSF provides tools for the globalization of web applications, including supporting number, currency, time, and date formatting, and the externalization of UI strings.
JSF 2.0 features and benefits

The JSF 2.0 specification is defined in JSR 314: JavaServer Faces 2.0. It builds on and extends the features that are available in JavaServer Faces 1.x.

This section describes the major features of JSF 2.0:

- Facelet usage
- Built-in Ajax support
- Annotation usage
- Creating templates
- New components
- Custom components

Facelet usage
JSF 2.0 uses Facelets, which are XHTML pages instead of JSP pages, as the view layer. Facelets relieve JSF of the restrictions that are imposed by JSP technology. For more information, see “Improving JSF by Dumping JSP” by Hans Bergsten in O’Reilly on Java.com, 9 June 2004:


Facelets: Facelets are the standard view decoration language for JSF application development in JSF 2.0. We do not recommend combining Facelets and Faces JSP pages in the same project.

Built-in Ajax support
In JSF V1.x, it was possible to use Ajax with JSF, but this capability required additional component libraries. Now with JSF 2.0, a JavaScript library for performing simple Ajax operations is provided. No additional libraries are required. The example application in this paper uses Ajax.

Annotation usage
With JSF 2.0, Java classes can be directly annotated, which eliminates the need to register these classes in faces-config.xml. For example, @ManagedBean indicates that this class is a Faces Managed Bean. The @ManagedBean annotation can be used in place of a managed-bean entry in faces-config.xml.

Other annotations, such as @FacesComponent and @FacesRenderer, are also available.

Creating templates
Facelet pages can be created from templates to allow a more uniform look across your project and to aid with future maintenance. We describe the creation of these templates in “Creating Facelet templates” on page 14.

New components
JSF provides various components for use in your web pages. In addition to the components that were available in JSF 1.x (Input Text, Output Text, Data Table, and other components), JSF 2.0 includes two new components that simplify GET navigation: <h:link> and <h:button>.

For more information about components that are available on Facelet pages, see the following website:

Custom components
Composite components build on the templating features of Facelets so that you can implement custom components. The advantage to custom components is that you can implement them without any configuration and without any Java code.

More detailed information and examples are available at the following website:

The steps for creating and customizing custom components with the Rational Application Developer are described in detail in the following information centers:

JSF 2.0 application architecture

You can extend the JSF application architecture easily in various ways to suit the requirements of your particular application. You can develop custom components, renderers, validators, and other JSF objects and register them with the JSF run time.

This section highlights the JSF 2.0 application architecture, as shown in Figure 1.
The JSF application architecture includes these components:

- Facelet pages: These pages are built from JSF components, where each component is represented by a server-side class.
- Faces servlet: One servlet (FacesServlet) controls the execution flow.
- XML/Annotation Configuration: The configuration of validators and Faces managed beans can be defined either with the XML file faces-config.xml or by using annotations.
- Tag libraries: The JSF components are implemented in tag libraries.
- Validators: Java classes are used to validate the content of JSF components. For example, user input can be validated according to specific business logic.
- Faces managed beans: JavaBeans are defined in the configuration file to hold the data of JSF components. Faces managed beans represent the data model and are passed between the business logic and user interface.
- Events: Java code is executed in the server for events, such as pushing a button and invoking business logic.
- Ajax: Ajax is supported by JSF 2.0 as a built-in feature.

Figure 2 represents the structure of a simple JSF 2.0 application, in this case, our RAD8JSFWeb project.
JSF features in Rational Application Developer

Rational Application Developer provides a number of rich features to enhance your usage of the JSF framework:

- **JSF Trace**
- **Integration of third-party JSF tag libraries**
- **Customizable data templates**

**JSF Trace**
For help debugging your JSF application or reviewing the phases of the JSF lifecycle, you can use JSF Trace. This feature visually displays information about your application at run time, including incoming requests, error messages, and objects in the request, session, and application scopes.

JSF Trace is covered in detail in “Debug and troubleshoot JavaServer Faces applications by using JSF Trace in Rational Application Developer” by Yury Kats in IBM developerWorks®, 24 September 2009:


**Integration of third-party JSF tag libraries**
JSF has a set of standard components for building web pages. These standard components can be supplemented with components from JSF tag libraries that were created by other companies. Rational Application Developer makes it easy to integrate these third-party tag libraries, and even to customize the tooling for these tags.

For more information, see “Faces library definitions for third-party JavaServer Faces controls” by Scott Paxton in IBM developerWorks, 18 June 2009:


**Customizable data templates**
Rational Application Developer makes it easy to generate UI components based on the data structures of your project. Simply by adding a data source, such as a Faces managed bean, to the Page Data view and then dragging it onto your web page, you can create controls that are connected to that data source.

For even more control over the controls that are generated on your web page, see “Introduction to JavaServer Faces data templates” by Christie Rice in IBM developerWorks, 25 September 2009:


Developing a web application by using JSF and JPA

In this section, we describe a web application that is implemented with JavaServer Faces (JSF) and Java Persistence API (JPA). For each Facelet that we create, a managed bean class is generated. For each action in the Facelet, a method in the managed bean class is invoked. In those methods, we use the JPA Manager Beans to retrieve the necessary data.
Rational Application Developer provides tooling to interact directly with the JPA entities without using a session bean. A JPA Manager Bean is created for each JPA entity with methods, such as find and update.

**Structure of the JSF web application**
The sample application consists of the following pages:

- Login page (login): Validates a customer's unique ID. If the ID is valid, display the customer details page.
- Customer details page (customerDetails): Shows details (title, first name, and last name) of a customer and the associated account balances.

You can find a completed version of the web application in the `c:\4883codesolution\jsf\RAD&JSFWeb.zip` project file.

**Setting up the ITSOBANK database**
The JPA entities are based on the ITSOBANK database. Therefore, we must define a database connection within Rational Application Developer that the mapping tools use to extract schema information from the database.

**Creating the Derby database**
The `\4883code\database\derby` directory provides command files to define and load the ITSOBANK database in Derby. For the `DerbyCreate.bat`, `DerbyLoad.bat` and `DerbyList.bat` files, you must install WebSphere Application Server in the `C:\IBM\WebSphere\AppServer` folder. You must edit these files to point to your WebSphere Application Server installation directory if you installed the product in a separate folder.

In the `\4883code\database\derby` directory, you can execute the following command files:

- `DerbyCreate.bat` to create the database and table
- `DerbyLoad.bat` to delete the existing data and add records
- `DerbyList.bat` to list the contents of the database

These command files use the SQL statements and helper files that are provided in the following files:

- `itsobank.ddl`: Database and table definition
- `itsobank.sql`: SQL statements to load sample data
- `itsobanklist.sql`: SQL statement to list the sample data
- `tables.bat`: Command file to execute `itsobank.ddl` statements
- `load.bat`: Command file to execute `itsobank.sql` statements
- `list.bat`: Command file to execute `itsobanklist.sql` statements

The Derby ITSOBANK database is created in the `\4883code\database\derby\ITSOBANK` directory.

**Creating a connection to the ITSOBANK database**
To connect to the Derby ITSOBANK database by using the New Database Connection wizard, follow these steps:

1. Because Derby allows only one connection, stop WebSphere Application Server if it is running and if you accessed the ITSOBANK database.
2. Select **Window → Open Perspective → Other** to open the Data perspective. In the Open Perspective window, select **Data** and click **OK**.
3. In the Data perspective, locate the Data Source Explorer view, which is typically in the lower left in the Data perspective.

4. In the Data Source Explorer, right-click Database Connections and select New.

5. In the New Connection wizard (Figure 3), follow these steps:
   a. Clear Use default naming convention, and for Connection Name, type ITSOBANKderby.
   b. For Select a database manager, select Derby.
   c. For JDBC driver, select Derby 10.2 - Embedded JDBC Driver Default.
   d. For Database location, click Browse and locate the \4883\code\database\derby\ITSOBANK directory.
   e. Leave the User name and Password fields empty; the Derby database does not require authentication.
   f. Select Create database (if required).
   g. Click Test Connection. A window opens and shows the “Connection succeeded” message. Click OK to close the window.
   h. Click Next.

![Figure 3  New Connection: Connection Parameters window](image-url)
You can use filters to exclude data objects, such as tables, schemas, stored procedures, and user-defined functions, from the view. Only the data objects that match the filter condition are shown.

6. To see the objects in the ITSO schema, in the Filter window (Figure 4), follow these steps:
   a. Clear the **Disable filter** check box.
   b. Select **Selection**.
   c. Select **Include selected items**.
   d. From the schema list, select **ITSO**.
   e. Click **Finish**.

![Figure 4](image-url)
7. When the connection is displayed in the Data Source Explorer, expand **ITSOBANK** [Apache Derby 10.5.1.1 ...] → **ITSOBANK**. The Schemas folder is marked as [Filtered]. Only one schema (ITSO) is listed, and the others are filtered (Figure 5).

![Data Source Explorer](image)

Figure 5  Connection with schema and tables in Data Source Explorer

With the filter framework, you can filter out the tables at a more granular level. Suppose that we want to see only tables that start with the letter A. Follow these steps:

1. Expand the schema **ITSO**, right-click **Tables**, and select **Filter**.
2. In the Filter window, follow these steps:
   a. Clear the **Disable filter** check box.
   b. Select **Expression**.
   c. In the Name section, select **Starts with the characters** and type **A**.
   d. Click **OK**.
   
   Now you can see only two tables in the Data Source Explorer: ACCOUNT and ACCOUNT_CUSTOMER.

3. To disable the filter, right-click **Tables**, select **Filters**, and select **Disable filter**. Click **OK**.

**Configuring the data source**

You can choose from one of the following methods to configure the data source:

- Use the WebSphere administrative console.
- Use the WebSphere Enhanced EAR, which stores the configuration in the deployment descriptor and is deployed with the application.

While developing JSF and JPA web applications with Rational Application Developer, the data source is created automatically when you add JPA-managed data to a Facelet file. The data source configuration is added to the EAR deployment descriptor.

However, if you already defined the **ITSOBANK** derby data source on the server, you might experience problems, because you can have only one active connection to the database. To clear the connection, remove all applications from the server and then restart the server.
Creating the JSF Project

In this section, we describe how to create a dynamic web JSF project.

This application consists of RAD8JSFWebEAR (the enterprise application) and RAD8JSFWeb (the web application). Follow these steps:

1. In the Enterprise Explorer view, right-click and select **New → Project**.
2. In the New Project wizard, select **Web → Dynamic Web Project** and click **Next**.
3. In the New Dynamic Web Project wizard, define the project details (Figure 6):
   a. For the Project name, type RAD8JSFWeb.
   b. Leave **Use default location** checked.
   c. For the Target Runtime, select **WebSphere Application Server v8.0 Beta**.
   d. Leave the Dynamic web module version at **3.0**.
   e. For the Configuration, select **JavaServer Faces v2.0 Project** and click **Modify**.

![Figure 6   New Dynamic Web Project wizard](image)
f. In the Project Facets window, select the following Project Facets (Figure 7):
   - Dynamic Web Module: Preselected
   - Java: Preselected
   - JavaServer Faces: Preselected
   - JPA: Select this facet
   - WebSphere Web (Co-existence): Preselected
   - WebSphere Web (Extended): Preselected

![Project Facets](image)

**Figure 7 Web project facets for JSF**

g. Click **OK**. The value of Configuration in the Dynamic Web Project window changes to `<custom>`.

h. Click **Next**.

4. Accept the source folder `src` and click **Next**.

5. Select **Generate web.xml deployment descriptor** and click **Next**.

6. In the JPA Facet page, complete these steps:
   a. Leave **RAD JPA 2.0 Platform** selected for the Platform.
   b. Leave **Library Provided Target Runtime** selected for the Type.
c. For the connection, select the **ITSOBANKderby** that was defined before. Complete these tasks:
   - Click **Connect** if the connection is not active.
   - In case you did not create the connection to the ITSOBANK database yet, click **New Connection** to define it.

d. Select **Override default schema from connection** and select **ITSO**.

e. For Persistence class management, select **Discover annotated classes automatically**.

f. Select **Create mapping file (orm.xml)**. See Figure 8.

g. Click **Next**.

7. In the JSF Capabilities page, leave **Default JSF Implementation** selected.
8. Click **Finish**. The project is created for you.
9. Switch to the **Web perspective** when prompted.
10. **Close** the Technology Quickstarts.
Creating Facelet templates

Before we create the Facelet web pages, login and customerDetails, we define the template that these pages use. This template helps to provide a consistent format to the application by creating universal header and footer sections.

Creating the template

Follow these steps to create the template:
1. In the Enterprise Explorer, expand RAD8JSFWeb and select the folder WebContent.
2. Right-click folder WebContent. Select New → Folder and type layout as the name.
3. Right-click folder layout and select New → Web Page.
4. In the New Web Page window, specify the details for this web page (Figure 9):
   a. Type itsoLayout for the File Name.
   b. Select Facelet as the type of Template.

5. Click Finish and the itsoLayout.xhtml file opens.

![Image of New Web Page window](Figure 9)
Creating the header

First, we create the header for our template:

1. In the Palette view, go to the Standard Faces Components drawer and select **Panel - Grid**.
2. Drag this Insert tag to the itsoLayout page (Figure 10):
   a. In the Design view, you see a visualization of the new tag with the text: grid1: Drag and Drop Items to this area to populate this region.
   b. Click this text and open the **Properties** view.
   c. The **h:panelGrid** tab is selected in the Properties view. Enter 2 for the number of Columns.

3. We import the logo that we use in the page header. In the Enterprise Explorer, right-click **WebContent** under RAD8JSFWeb and select **New → Folder**.
4. Enter resources for the folder name and click Finish.

5. We create a folder called images inside the resources folder. Right-click the new resources folder and select New → Folder.

6. Enter images for the folder name and click Finish.

7. Now that the folders are created, we can import the logo. Right-click images and select Import. Click General → File System. Click Next.

8. Locate itso_logo.gif on your file, which is in 4883code/jsf. Browse to the location of this file. Click Finish.

9. The file is imported (Figure 11).

   ![Figure 11](image.png)

   Figure 11 Itso_logo imported into the project

10. Drag an image from the Standard Faces components drawer of the Palette, dropping it on top of the text grid1.

11. Go to the Properties view. The h:graphicImage tab is selected. Click Browse next to Name. In the Select an image resource dialog window, select itso_logo.gif from under images and click OK. The logo is visible on your page.

12. Switch to the Accessibility tab of the Properties view, which is located under h:graphicImage. Enter ITSO logo for the Alternate Text.

13. Drag an Output from the Palette and drop it on the right side of the logo.

14. Go to the Properties view. The h:outputText tab is selected. Type ITSO RedBank for the Value.


   We created the header for our page that shows the logo of the bank and a title, as shown in Figure 12 on page 17.
Creating the content area

We create a content area to hold the content of our login and customerDetails pages. Complete these steps to create the content area:

1. Expand the HTML Tags drawer in the Palette. Drag a Horizontal Rule to the page and drop it beneath the Panel Grid.

2. Expand the Facelet Tags drawer. Drag an Insert to the page and drop it beneath the Horizontal Rule.

3. Go back to the HTML Tags drawer. Drag a second Horizontal Rule and drop it at the bottom of the page.

4. Click the text Drop controls here for content area “< no name >” and go to the Properties view. The ui:insert tab is selected. Enter pageContent as the Name, as shown in Figure 13 on page 18.

Save the page.
Creating the footer

Complete these steps to create the footer:

1. We create a footer for the page, which consists of a simple text string. Drag an Output from the Standard Faces Components drawer of the Palette and drop it at the bottom of the page.

2. Go to the Properties view. Enter Created by ITSO, 2010 for the Value (Figure 14).
3. Save the page.

Creating Facelets

In this section, we create the login.xhtml and customerDetails.xhtml Facelets based on our layout template, itsolayout.xhtml:

1. In the Enterprise Explorer, expand RAD8JSFWeb and select the folder WebContent.
2. Right-click WebContent and select New → Web Page. Complete these tasks:
   a. Type login for the File Name.
   b. Select your defined template itsolayout.xhtml in the folder layout under MyTemplates (Figure 15).

3. Click Finish. The login.xhtml file opens.
4. Use the same steps to create the customerDetails.xhtml Facelet.
Creating JPA Manager Beans

In this section, we create JPA Manager Beans and JPA entities for the ITSOBANK database.

Creating entities
Complete these steps to create the entities:

1. If the server is running and is connected to the ITSOBANK database, stop the server.
2. Open customerDetails.xhtml and go to the Page Data view.
3. Expand JPA. Right-click JPA Manager Beans and select New → JPA Manager Bean (Figure 16).

   ![Figure 16 Creating a JPA Manager Bean from the Page Data view](image)

4. In the JPA Manager Bean Wizard, click Create New JPA Entities.

   **Important:** To retrieve records from the relational database, we require a connection. We use the ITSOBANKderby connection that was created in “Creating the JSF Project” on page 11.

5. In the Generate Custom Entities wizard, define the connection, schema, and tables (Figure 17 on page 21):
   a. For the Connection, select ITSOBANKderby.
   b. For the Schema, select ITSO (click Connect if you do not see this schema listed).
   c. Click the Select All icon to select the four tables.
   d. Select Update class list in persistence.xml so that the generated classes are added to the file.
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6. Click **Next** on the Table Associations page.

7. In the Customize Default Entity Generation page, define the Table mapping and the package name (Figure 18 on page 22):
   a. For the Table mapping definition, for the Key generator, select **none**.
   b. For the Entity access, select **Field**.
   c. For the Associations fetch, select **Default**.
   d. For the Collection properties type, select **java.util.List**.
   e. Clear **Always generate optional JPA annotations and DDL parameters**.
   f. For the Package, type **itso.bank.entities**.

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**Figure 17  Select tables**

e. Click **Next**.
g. Click **Next**.

8. In the Generate Custom Entities: Customize Individual Entities window, define the class names (Figure 19):
   a. Select **TRANSACT** in the Tables and columns pane.
   b. The default class name is **Transact**. Change the class name to **Transaction**.
9. Click **Finish**.

**Editing the Customer entity**

Complete these steps to edit the Customer entity:

1. In the JPA Manager Bean Wizard window, the Account, Customer, and Transaction entities are displayed.

2. Select the **Customer** entity and click **Edit Selected Entities**.

3. In the Tasks page, go through the tasks, and make the following selections:
   a. For the Primary key, ensure that **ssn** is selected.
   b. For the Relationships, ensure that **Account** is selected.
   c. For Named Queries, click **Add**.
   d. In the Add Named Query dialog box, ensure that **getCustomer** is the Named Query Name and then click **OK**.
e. For Concurrency Control, ensure that No Concurrency Control is selected.

f. Leave all check boxes clear for the Other task.

g. Select Automatically set up initial values for JDBC Deployment.

h. Click Finish to return to the JPA Manager Bean Wizard window.

4. Click Next in the JPA Manager Bean Wizard window.

5. In the Tasks window, click the Other task.

6. Select I want the container to inject the persistence unit into my beans and check Generate JSF Converter for target entity.

7. Click Finish.

Editing the Account entity
We add additional JPA managers and we create a JPA Manager for Accounts:

1. In the Page Data view on customerDetails.xhtml, right-click JPA Manager Beans and select Configure JPA Manager Beans.

2. In the JPA Manager Bean wizard, click Create new JPA Manager.

3. Select Account and then click Edit Selected Entities.

4. Click Named Queries.

5. Click Add.

6. On the Add Named Query dialog window, change the name to getAccountBySSN and change the query statement to select a from Account a, in(a.customers) c where c.ssn =:ssn order by a.id. This code snippet is available in the 4883code/jsf/getAccount.txt file.

7. Click OK, Finish, and then Finish again.

8. Click Cancel.

9. The AccountManager bean is now created for you.

Creating JPA page data
Now we add JPA page data so that the JSF components can interact with the JPA data. We want a single customer record and a list of accounts.

Customer record
Follow these steps:

1. Open customerDetails.xhtml. In the Page Data view, right-click JPA and select New → JPA Page Data.

2. In the Add JPA data to page dialog window, select CustomerManager and select Retrieve a single record.

3. Click Next twice.

4. On the Set Filter Values page, change the primary key value to #{sessionScope.customerId}. Click Finish.
Account list
Follow these steps:
1. In the Page Data view, right-click JPA and select New → JPA Page Data.
2. In the Add JPA data to page dialog window, select AccountManager and select Retrieve a list of data.
3. Click Next twice.
4. On the Set Filter Values page, change the primary key value to #{sessionScope.customerId}. Click Finish.
5. Save the page.

Editing the login page
Next, we complete our login page. We add UI components, simple validation, and navigation to go from login.xhtml to customerDetails.xhtml.

Adding UI components
Instead of adding each UI component individually, we define data for the customer ID and have Rational Application Developer generate the necessary UI for us:
1. Open login.xhtml. Open the Page Data view. Right-click Scripting Variables and select New → Session scope variable.
2. In the Add Session Scope Variable dialog window, enter customerId for the Variable name and java.lang.String for the Type (Figure 20).
3. Click OK.
4. In the Page Data view, expand Scripting Variables → sessionScope. Click customerId and drag it to the page and drop it on top of “Drop controls here”.
5. In the Insert JavaBean wizard, select Inputting data.
6. Change the label from CustomerId to Enter your customer ID: (Figure 21 on page 26).
7. Click **Options**. Select the **Buttons** tab of the Options dialog window, and change the label to **Login**.

8. Click **OK** and then click **Finish**. Figure 22 on page 27 shows the login page.
9. Save the page.

Adding validation
You can add simple validation to your web page easily by using JSF. Here, we ensure that the user types an 11-digit number for the customerId:
1. Click the customerId Input Text.
2. Go to the Properties view and switch to the Validation tab (under h:inputText).
3. Check Value is required.
4. Enter 11 for both the Minimum length and the Maximum length (Figure 23 on page 28).
5. Save the page.

Verifying the customer ID
We want to ensure that the customerId is valid and that our RedBank application has a customer with that ID:

1. In the Enterprise Explorer, select RAD8JSFWeb → Java Resources → src → pagecode → Login.java. This bean is a Faces-managed bean that was created automatically by Rational Application Developer. We add a method that runs when the button is clicked.

2. Paste in the code that is shown in Example 1. This code is available in the 4883code/jsf/LoginButton.txt file.

   Example 1 LoginButton
   
   ```java
   public String doLoginAction() {
       try {
           String id = (String) getSessionScope().get("customerId");
           System.out.println("Logon id: " + id);
           CustomerManager customerManager = (CustomerManager) getManagedBean("CustomerManager");
           Customer customer = customerManager.findCustomerBySsn(id);
           if (customer == null) {
               throw new Exception("Customer " + id + " was not found.");
           }
           return "login";
       } catch (Exception e) {
           getFacesContext().addMessage("id", new FacesMessage(e.getMessage()));
           return null;
       }
   }
   ```

3. If you get errors for unknown imports, right-click the new text and select Source → Organize Imports. The following import statements are automatically added for you:

   - import itso.bank.entities.Customer;
   - import itso.bank.entities.controller.CustomerManager;
   - import javax.faces.application.FacesMessage;

4. Save the login.xhtml and Login.java files.
5. Open `login.xhtml`. Click the button.
6. Go to the Properties view. Click Select or code an action button (next to Action or outcome) and then choose Select an action.
7. In the Faces Action selection dialog window, click Page Code → `doLoginAction` and click OK.
8. Save `login.xhtml`.

**Adding navigation**

We add navigation so that the customer's details can be displayed if the customer ID is valid:

1. Open `login.xhtml`. Click the button.
2. Go to the Properties view. Click Add Rule.
3. In the Add Navigation Rule dialog window, select `customerDetails.xhtml` for the page.
4. Select The outcome is and then type `login` (Figure 24).

![Add Navigation Rule dialog window](image)

Figure 24 Login page

5. Click OK.

The `login.xhtml` page is now complete.
Editing the customer details page

For our customerDetails page, we display the information about a particular customer and show the associated bank account balances.

Displaying customer information

Follow these steps:

1. Open customerDetails.xhtml. Go to the Page Data view.

2. Expand JPA → JPA Page Data. Click customer. Drag customer to the page, and drop it on top of the Drop Controls here text.

3. In the Add JPA data to page wizard, make the following changes (Figure 25):
   a. Clear customer.accounts.
   b. Move customer.title up so that it is over customer.firstName.
   c. Change the label of customer.ssn to “Customer ID:”.
   d. Change the label of customer.firstname to “First Name:”.
   e. Change the label of customer.lastname to “Last Name:”.
   f. Change the control type of customer.ssn to Display Text.

4. Click Options.
5. On the Buttons tab, change the label to Update.
6. Click OK and click Finish.

Displaying account information
Follow these steps:
1. In the Page Data view, expand JPA → JPA Page Data → accountList → accountList. Click the inner accountList and drag it to the page. Drop it after Error Messages.
2. In the Add JPA data to page wizard, make the following changes (Figure 26):
   a. Clear customers and transacts.
   b. Change the id label to Account Number.

3. Click Finish.
   The customerDetails page contains customer and account information (Figure 27 on page 32).
4. Save `customerDetails.xhtml`.

5. In the Enterprise Explorer view, open `RAD8JSFWeb → Java Resources → src → pagecode → CustomerDetails.java`.

6. Find the method `getAccountList()`.

7. Replace the line `Object ssn =` with `Object ssn = getSessionScope().get("customerId");`

   This code is available in `4883code/jsf/getAccountList.txt`. See Figure 28.

   ```java
   @JPA(entityManager = itso.bank.entities.controller.AccountManager.class, targetNamedQuery = "getAccountBySSN")
   @JPAFilter(name = "ssn", value = "#{sessionScope.customerId}")
   public List<Account> getAccountList() {
     if (accountList == null) {
       AccountManager accountManager = (AccountManager) getManagedBean("AccountManager");
       Object ssn = getSessionScope().get("customerId");
       accountList = accountManager.getAccountBySSN(ssn);
     }
     return accountList;
   }
   ```

   Figure 28  New `getAccountList()` method

8. Save `CustomerDetails.java`. 

---

32  Developing Web Applications using JavaServer Faces
Updating customer information

Our page has an Update button. We ensure that it can update simple customer information:

1. In the Enterprise Explorer view, open RAD8JSFWeb → Java Resources → src → pagecode → CustomerDetails.java.
2. Paste in the code that is shown in Example 2, which is available in the 4883code/jsf/UpdateButton.txt file.

Example 2  updateButton

```java
public String doUpdateAction() {
    CustomerManager customerManager = (CustomerManager)getManagedBean("CustomerManager");
    try {
        customerManager.updateCustomer(customer);
    } catch (Exception e) {
        logException(e);
    }
    return "update";
}
```

3. Save CustomerDetails.java.
4. Open customerDetails.xhtml. Click Update and go to the Properties view.
5. Click Select or Code an action and then choose Select an action.
6. In the Faces Action selection dialog window, click Page Code → doUpdateAction and click OK.
7. In the Properties view, click Add Rule.
8. In the Add Navigation Rule dialog window, select CustomerDetails.xhtml for the Page. Select The outcome is and type update.
9. Click OK.
10. Save the page.

Using Ajax

We already have an Update button on our customerDetails.xhtml page to update customer information. We decide to add a second update button that uses Ajax.

Follow these steps:

1. Open customerDetails.xhtml. Drag a Button – Command from the Standard Faces Components drawer of the palette and drop it next to the existing button.
2. In the source, change the value of the new button to Ajax Update, which changes the label of the button.
3. Go to the Properties view. The h:commandButton tab is selected.
4. Go to the Ajax tab.
5. Click Support Ajax.
6. We want to allow the user to update the customer's first name, last name, and title. Type firstName1 lastName1 title1 into the Execute combination box.
7. Select form1 for Render.
8. Select Click to create/edit custom code.
9. The Quick Edit view automatically opens. Ensure that **listener** is selected.

10. Paste in the code that is shown in Example 3, which is also available in the code/jsf/ajaxButton.txt file.

   **Example 3  ajaxButton**

   ```java
   CustomerManager customerManager = (CustomerManager)getManagedBean("CustomerManager");
   try {
       customerManager.updateCustomer(customer);
   } catch (Exception e) {
       logException(e);
   }
   ```

   The code is shown in Figure 29.

   ![Figure 29  Button with Ajax](image)

11. Save the page.

**Running the JSF application**

Now we run our web application and see the results:

1. In the Enterprise Explorer view, right-click `login.xhtml` and select **Run As → Run on server**.

2. Select a server and make any other necessary selections.

3. When the login page opens, you can interact with your web application.

4. If you enter a user ID that is too short, such as 1234, or that does not have a customer associated with it, an error message displays. See Figure 30 on page 35.
5. If you enter a valid user ID, such as 444-44-4444, the details for that customer are shown. See Figure 31.

6. On the customer details page, you can change the first name, last name, and title of the customer. Click either Update or Ajax Update to save those changes.
Final code

To run the web application, you must complete the previous steps or import the sample from 4883codesolution/jsf/RAD8JSFWeb.zip.

You also must set up the ITSOBANK database, as described “Creating the JSF Project” on page 11.

More information

For more information about JSF 2.0, see the following resources:

- **JSR 314: JavaServer Faces 2.0:**
  

- **Rational Application Developer Information Center:**
  
  

- **IBM developerWorks:**
  
  
  
  
  
  
  facelet_template.swf?version=1
  

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The additional web material that accompanies this paper includes the following files:

<table>
<thead>
<tr>
<th>File name</th>
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</thead>
<tbody>
<tr>
<td>4883code.zip</td>
<td>Compressed file that contains sample code</td>
</tr>
<tr>
<td>4883codesolution.zip</td>
<td>Compressed file that contains solution interchange files</td>
</tr>
</tbody>
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**System requirements for downloading the web material**

We recommend the following system configuration:

- **Hard disk space:** 20 GB minimum
- **Operating system:** Microsoft Windows or Linux
- **Processor:** 2 GHz
- **Memory:** 2 GB

**The team who wrote this paper**

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